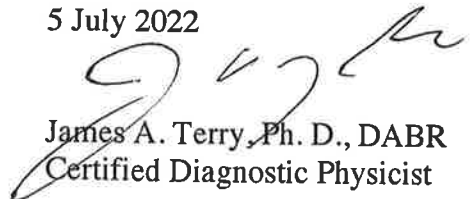


RECOMMENDATIONS FOR REQUIRED RADIATION PROTECTION

**ST. TAMMANY BONE AND JOINT CLINIC
71211 HIGHWAY 21
COVINGTON, LA 70433**

X-RAY ROOM 128

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Refer to plan of X-Ray Room 128, St. Tammany Bone and Joint Clinic, 71211 Highway 21., Covington, LA 70433, submitted by Brandon Talley, CHC/ Construction Supervisor for identification of barriers. See sample calculation sheet for computation of barrier thickness.

RADIOGRAPHIC X-RAY ROOM 128:

Wall A: 1.58 mm, 1/16 inch (4 lbs/ft²) lead to extend the full width of the wall as indicated and to the height of seven feet.

NOTE: VIEW WINDOW: 1.58 mm, 1/16 inch (4 lbs/ft²) lead equivalent glass.

Wall B: 1.58 mm, 1/16 inch (4 lbs/ft²) lead to extend the full width of the wall as indicated and to the height of seven feet.

Wall C1 & C2: 1.58 mm, 1/16 inch (4 lbs/ft²) lead to extend the full width of the wall as indicated, including door and door frame, and to the height of seven feet.

NOTE: AREA BEHIND CHEST RACK & 12" border: 2.38 mm, 3/32 inch (6 lbs/ft²) lead total protection required. 1/32" (2 lbs/ ft²) additional lead required.

Wall D: 2.38 mm, 3/32 inch (6 lbs/ft²) lead to extend the full width of the wall as indicated and to the height of seven feet.

Wall E: 1.58 mm, 1/16 inch (4 lbs/ft²) lead to extend the full width of the wall as indicated, including door and door frame, and to the height of seven feet.

NOTE: AREA BEHIND CHEST RACK & 12" border: 2.38 mm, 3/32 inch (6 lbs/ft²) lead total protection required. 1/32" (2 lbs/ ft²) additional lead required.

Ceiling: No floor above, no occupied area, no shielding required.

Floor: No floor below, no occupied area, no shielding required.

STRUCTURAL DETAILS

The following structural details should be followed where applicable:

1. Lead barriers should be mounted in such a manner that they will not sag or cold flow because of their own weight. They shall be protected against mechanical damage.
2. The joints of lead shields should be constructed so that their surfaces are in contact and with an overlap of not less than 1/2 inch or twice the thickness of the sheet, whichever is greater.
3. Welded, or burned, lead seams are satisfactory if the lead equivalence of the seams is not less than that required of the barrier.
4. Protective barriers of solid block (or brick) construction should have mortar (without voids) of at least the same density as the block, and for multiple course construction, the joints should be staggered.
5. Joints between different kinds of protective material should be constructed so that the overall protection of the barrier is not impaired.
6. Doors and door frames shall have the same lead equivalent as that required of the adjacent wall. Special attention should be given to providing overlap of the shielding of the door frame and the shielding of the door.
7. Holes in the protective barriers shall be covered so that overall attenuation is not impaired.
8. Louvers and holes in barriers for pipes, conduits, service boxes and air ducts may require baffles to ensure that the overall protection afforded by the barrier is not impaired.
9. Minimum design requirements for an x-ray operator's booth:
 - a. Space Requirements. The operator shall be allotted not less than 0.8 square meter (7.5 square feet) of unobstructed floor space in the booth. The booth must protect the operator from the useful beam and any radiation which has been scattered only once.
 - 1) The minimum space as indicated above may be any geometric configuration but with no dimension less than 60 centimeters (2 feet).
 - 2) The space shall be allotted excluding any encumbrance by the console, such as overhang, cables or similar encroachments.

- 3) An extension of a straight line drawn between any point on the edge of the booth shielding and (1) a point 30 centimeters (1 foot) horizontally beyond the nearest vertical edge of the chest cassette holder or (2) any corner of the examination table shall not impinge on the unobstructed space.
- 4) The booth walls shall be at least 2.1 meters (7 feet) high and shall be permanently fixed to the floor or to other structure as may be necessary.
- 5) When a door or movable panel is used as an integral part of the booth structure, it must have a permissive device which will prevent an exposure when the door or panel is not closed (this type of booth structure is not recommended).

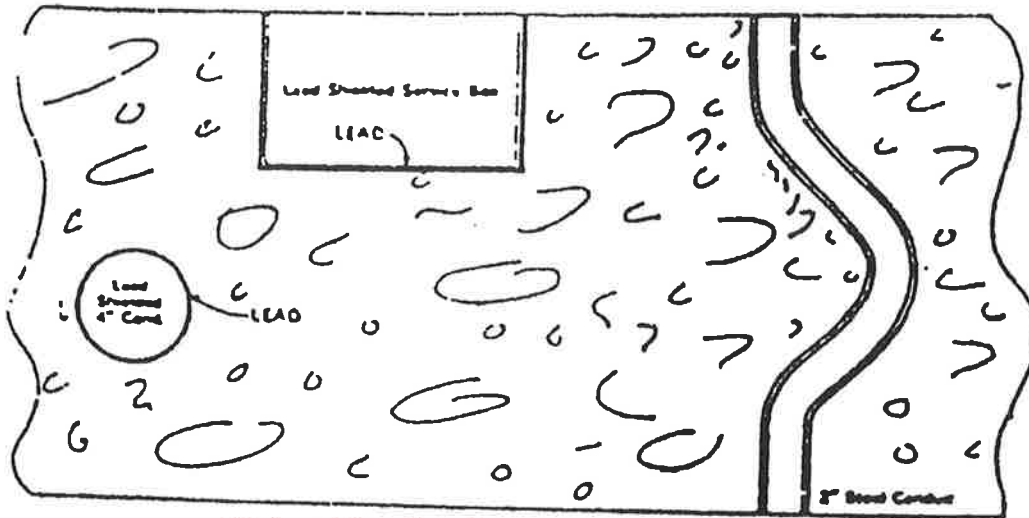
b. Switch Placement. The operator's switch for the radiographic machine shall be fixed within the booth and:

- 1) Shall be at least 1 meter (40 inches) from any open edge of the booth wall which is proximal to the examining table.
- 2) Shall allow the operator to use the majority of the unavailable viewing window (s).

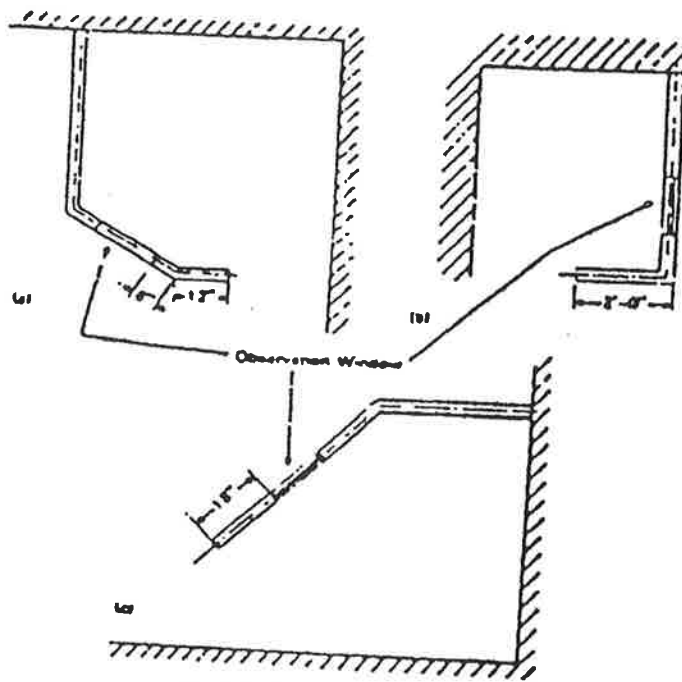
c. Viewing System Requirements.

- 1) Each booth shall have at least one viewing device which will:
 - a) Be so placed that the operator can view the patient during the exposure, and
 - b) Be so placed that he can have a full view of any occupant of the room and should be so placed that he can view any entry into the room. If any door which allows access to the room cannot be seen from the booth, then that door must have a permissive device controlling the exposure which will prevent the exposure if the door is not closed
- 2) When the viewing system is a window, the following requirements also apply:
 - a) It shall have a visible area of at least 925 square centimeters (1 square foot), the base of which is at least 135 centimeters (4.5 feet) above the floor.

- b) The distance between the proximal edge of the window and the open edge of the booth shall not be less than 45 centimeters (18 inches).
 - c) The glass shall have at least the same lead equivalence as that required in the booth's wall in which it is mounted.
- 3) When the viewing system is by mirrors:
- a) The mirror(s) shall be so located as to accomplish the general requirements as in c.1 above.
- 4) When the viewing system is by electronic means (e.g., TV, etc.):
- a) The camera shall be so located as to accomplish the general requirements in (c.1) above.
 - b) There shall be an alternate viewing system as a back up in case of electronic failure.

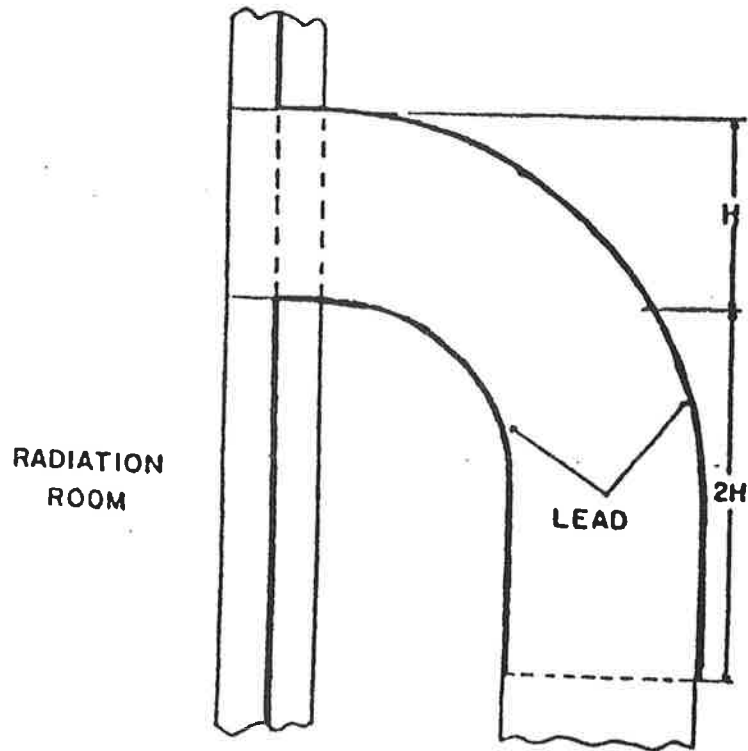


Lead shielding of service box and conduit in concrete barrier. On the right are shown the bends required for a conduit passing through the barrier.



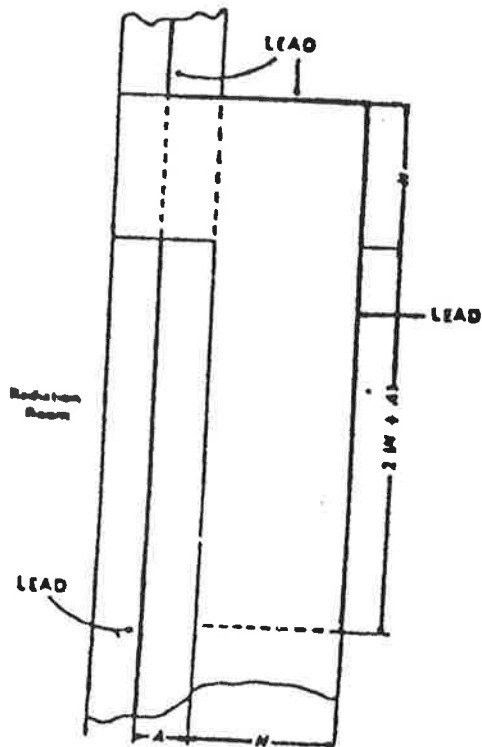
Typical designs of control stations.

Figure 1

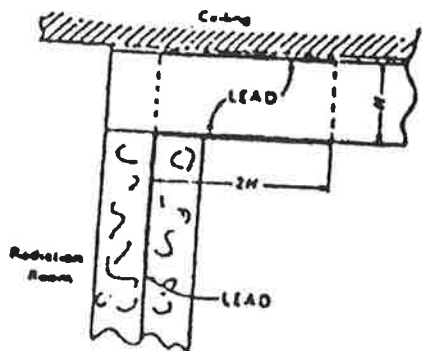


TYPICAL BAFFLE DESIGN FOR OPENINGS IN SECONDARY PROTECTIVE BARRIER

Lead shielding around ducts, conduits and pipes must have the same lead equivalent as that required of the adjacent wall.



Typical baffle design for opening in secondary protective barrier.



Typical baffle design for openings in secondary protective barrier.

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Assumptions and attenuation data from NCRP Report No. 49

X-RAY ROOM 128

Max KVp = 150, Max mA = 800, 3 Phase
H.V.L. = 0.3 mm Pb = 2.24 cm Concrete
W = 200 mA-min/wk @ 150 kVp
= 400 mA-min/wk @ 125 kVp
= 1000 mA-min/wk @ 100 kVp

Wall A: Control Booth Barrier, Secondary Barrier, Controlled Area,
d= 2.8816 meter, U=1, T=1

$$K_{ux} = \frac{16 d^2}{WUT} = \frac{16 (8.3034)}{1000 (1) (1)} = 0.1329; 0.10 \text{ mm Pb}$$

Barrier Requirement: (0.10 mm Pb + 1 HVL)+20% for 3φ; 0.48 mm Pb

Wall B: Exam Room & Hall, Secondary Barrier, Non-Controlled Area,
d= 4.1824 meter, U=1, T=1

$$K_{ux} = \frac{0.32 d^2}{WUT} = \frac{0.32 (17.4929)}{1000 (1) (1)} = 0.0056; 0.73 \text{ mm Pb}$$

Barrier Requirement: (0.73 mm Pb + 1 HVL)+ 20% for 3φ; 1.24 mm Pb

Wall C1: Casting Room, Secondary Barrier, Non-Controlled Area,
d= 2.3312 meter, U=1, T=0.5

$$K_{ux} = \frac{0.32 d^2}{WUT} = \frac{0.32 (5.4344)}{1000 (1) (0.5)} = 0.00348; 0.87 \text{ mm Pb}$$

Barrier Requirement: (0.87 mm Pb + 1 HVL)+ 20% for 3φ; 1.40 mm Pb

Wall C2: Patient RestRoom, Secondary Barrier, Non-Controlled Area,
d= 2.0560 meter, U=1, T=0.2

$$K_{ux} = \frac{0.32 d^2}{WUT} = \frac{0.32 (4.2271)}{1000 (1) (0.2)} = 0.00676; 0.68 \text{ mm Pb}$$

Barrier Requirement: (0.68 mm Pb + 1 HVL)+ 20% for 3φ; 1.18 mm Pb

NOTE: Area behind chest rack & 12" border: Primary Barrier, Patient RestRoom, Non-Controlled Area, d= 3.0092 meter, U=0.25, T=0.2

$$K_{ux} = \frac{0.002 d^2}{WUT} = \frac{0.002 (9.0553)}{1000 (0.25) (.2)} = 0.0003622; 1.70 \text{ mm}$$

Barrier Requirement: 1.70 mm Pb + 20% for 3φ; 2.04 mm Pb

Wall D: Therapy Area, Secondary Barrier, Non-Controlled Area, d= 1.6557 meter, U=1, T=1

$$K_{ux} = \frac{0.32 d^2}{WUT} = \frac{0.32 (2.7414)}{1000 (1) (1)} = 0.00088; 1.38 \text{ mm Pb}$$

Barrier Requirement: (1.38 mm Pb + 1 HVL)+ 20% for 3φ; 2.02 mm Pb

Wall E: Hallway, Secondary Barrier, Non-Controlled Area, d= 2.4563 meter, U=1, T=0.2

$$K_{ux} = \frac{0.32 d^2}{WUT} = \frac{0.32 (6.0333)}{1000 (1) (0.2)} = 0.00965; 0.55 \text{ mm Pb}$$

Barrier Requirement: (0.55 mm Pb + 1 HVL)+ 20% for 3φ; 1.02 mm Pb

NOTE: Area behind chest rack & 12" border: Primary Barrier, Hallway, Non-Controlled Area, d= 2.4338 meter, U=0.25, T=0.2

$$K_{ux} = \frac{0.002 d^2}{WUT} = \frac{0.002 (5.9234)}{1000 (0.25) (.2)} = 0.000237; 1.90 \text{ mm}$$

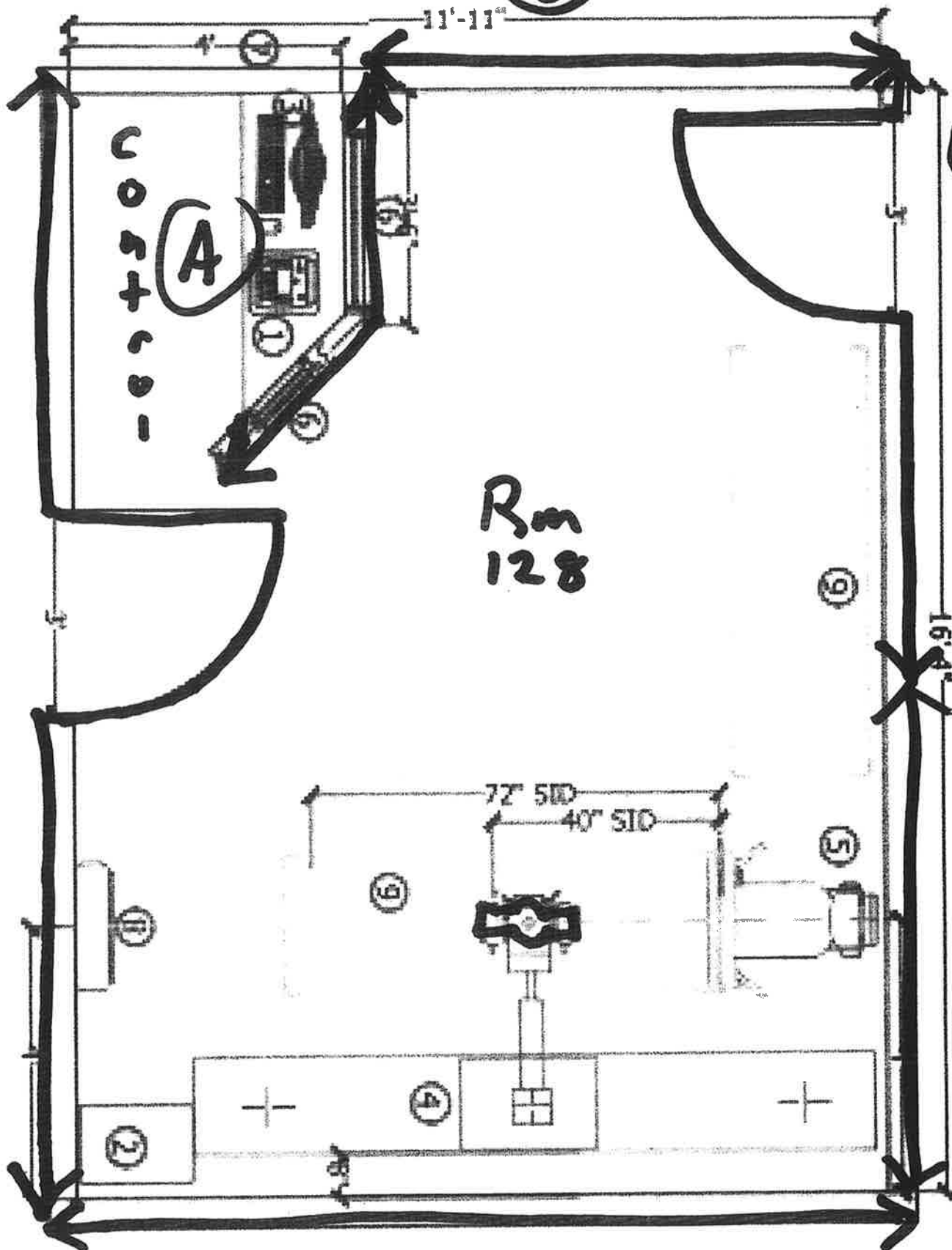
Barrier Requirement: 1.90 mm Pb + 20% for 3φ; 2.28 mm Pb

Ceiling: No Room above no occupied area. No shielding required

Floor: No room below, no occupied area. No shielding required.

Hall

(B) Exam Rm



(E) H 9-1-25

(12) counter
360
(13) door
360
(14) door
360

(D) Therapy Area